

UNITED STATES PATENT APPLICATION FOR  
A METHOD AND APPARATUS FOR HOME DESIGN AND BUILDING

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Signature Date: February 15, 2001

5           **A METHOD AND APPARATUS FOR HOME DESIGN AND BUILDING**

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[0002]           This application claims priority from provisional application "A METHOD AND APPARATUS FOR HOME DESIGN AND BUILDING", Application No. 60/182,680, filed February 15, 2000, and incorporated herein by reference.

**Field of the Invention:**

[0003]           The invention relates generally to the area of custom house design, and to systems for designing custom buildings.

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**Background of the Invention:**

5       **[0004]**       The methods used today for designing and building homes has changed little in the past several hundred years. Traditional homebuilders still utilize the historic methods of construction that rely on sub-contractors to get the job completed. Typically, several sub-contractors are used to stage or to erect the structure on-site by referring to a set of plans. Often these plans will be incomplete or inaccurate. As a result, construction materials are inefficiently field - measured at the site itself during the actual construction. This leads to wasted materials, imperfect fitting, and an often imperfect finished product.

10       **[0005]**       As a further issue, the timing of the entire construction project is impacted by weather, the availability of third party crews and sporadic building inspections. The whole process can take from 90-120 days. The overriding consequence is that costs for buildings constructed according to such historically used methods are high, ranging from \$200/square foot for a single or custom design, to \$80/square foot for mass-produced design (costs given are typical 2000 levels).

15       **[0006]**       At the entry level of the home buying scale home buyers are offered a limited selection of possible home choices in an attempt to standardize design, and to minimize construction changes. In doing this, neighborhoods lose their originality and character and instead become "subdivisions" and "tracts". The consumer is faced with ever higher prices and a limited set of home choices. Nonetheless, home buyers in the United States continue to acquire over \$100 billion worth of new homes each year.

20       **[0007]**       Manufactured homebuilders have developed out of the mobile home industry. A mobile home is characterized by modularity, a prevalence of standard components and sizes, and ease of construction. Manufactured homebuilders have taken the factory-based manufacturing efficiencies of the

mobile home industry and have applied them to the low end of the single family housing market. Costs for homes constructed using these methods are typically around \$40/square foot (2000 levels), and the quality of such homes is comparable to or better than entry level site-built homes constructed according to traditional methods of design. Manufactured homebuilders however usually only offer a limited range of options, and market the homes through an outdated and comparatively unsophisticated dealer network, much like their mobile home brethren. Today, manufactured housing in the United States is being built at a rate of \$14 billion annually and represents 29% of all new housing. The nationwide plants producing these homes are operating at a current utilization rate of less than 50%.

**[0008]** One of the most significant advances in the construction and home building industry is the development of computer aided design (CAD). The benefits and features of computer aided design applications have significantly advanced in recent years and it is now a standard platform for the majority manufactured homebuilders and for most architects. CAD technology allows for the introduction of significant design and construction flexibility in the building process and provides detailed construction-ready specifications in an electronic format that can be reviewed and approved with minimal lag time via online resources such as the Web or e-mail.

**[0009]** Architects who have achieved recognition in their field for creating outstanding designs are now searching for opportunities to bring their designs to the masses. As an example, some renowned architects and designers, have designed housewares to be sold in department stores nationwide. This design trend is part of an overall shift in consumer marketing practices, which have redefined consumer value as the combination of great design, individual consumer choice, and low cost. Some watch manufacturers have revolutionized

the watch industry by pioneering this approach of utilizing well-known contemporary designers, a large and ever expanding range of choices, and a large manufacturing base that allow them to achieve a price point that makes their product economically accessible to the masses.

5     **[0010]**         Local developers currently dominate the home-building industry. Their greatest competition is the regional homebuilders, who despite their purchasing power currently operate at a small net margin of approximately 5%. Regional homebuilders focus their efforts almost entirely on large tracts of land, employing a business model that is depends on standardization, high volume, and low margins. In order to complete, local developers must be continually on the lookout for any competitive advantages they can leverage to combat the economies of scale enjoyed by the regional builders.

10                   **[0011]**         Another common aspect of the current home building industry is the presence of market gaps between the existing manufactured housing buyer and the traditional entry-level site-built buyer. In many cases, a consumer may choose to rent when the market gap is too wide or the choices available within the two extents are not appealing. There is currently no intermediate option that is flexible enough to suit the needs of a large portion of available consumers.

15                   **[0012]**         The United States market is not alone in facing these challenges - the problem extends on an international and indeed global scale. International markets represent a currently under served opportunity. The countries with the largest populations, China, India and Mexico, all have "baby boom" demographic profiles and affordability crises. If they are not currently experiencing shortages in affordable and desirable housing, they may well soon, and now is the time to specifically target such a problem with new and interesting solutions.

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**Summary of the Invention:**

5       **[0013]**       The invention proposes a solution to the often overlooked 'middle ground' of property construction and particularly home building. Roughly described, the invention provides a system for allowing a user, who may be either a prospective home buyer, a sales agent, a property developer or any other person or entity interested in building management, to customize and specify a new home using a standard set of home shapes and components. This approach allows a diverse group of participants, builders, contractors, and consumers to work together for the benefit of all the participants.

10       **[0014]**       With multiple sources for each relationship accessed via a Web site consumers benefit with greater value: expanded choices, better design, better quality and lower costs. The invention allows consumers to drive the home buying experience instead of the developers. They have the option of accessing the Web site via the Web itself or at the location (sales office) of a "franchised" developer.

15       **[0015]**       Local Developers benefit by having more competitive products to offer consumers. Well known architects can benefit from using the invention by receiving a design fee each time one of their designs is sold or used in designs of a job site or home. Manufactured Homebuilders benefit from the increased utilization of their existing plants. Several manufacturing companies may be affiliated to provide geographic coverage throughout the nation and ensure adequate capacity coverage.

20       **[0016]**       In one embodiment, the invention comprises a mechanism for building design and construction, comprising: a server hosting a communications device for communicating with a user; a design device controlled by inputs received from a user via said communications device; a user interface device configured to communicate a user interface to said user, said user interface

providing any of selection, arrangement or other modification of design features of a building in a format readable by said user; and an ordering mechanism to order building and shipment of parts and labor required to construct the designed building.

5     **[0017]**       In another embodiment, the invention comprises a system for allowing a user to create a custom building design, comprising a central server having stored thereon a database of building design elements, wherein each entry in said database describes a building design element data and includes the availability and the design characteristics of said building design element; a  
10   communications link to a building design element vendor for obtaining said building design element data; a user interface for presenting a set of available design options to a user, and for receiving from said user a set of preferred design options; and, a database processor for updating the contents of the database with updated building design element information received from the  
15   vendor.

**[0018]**       In a further embodiment, the invention comprises a system for building design and construction comprising: a server hosting communications with entities including consumers, manufacturers, developers, designers and suppliers, wherein said server stores data for said entities; a design device that  
20   can select among the data stored by said server; a user interface device that can allow a user to make design and construction selections from the data stored on said server; and, an ordering mechanism that the user can use to order the design and construction selections.

25    **Brief Description of the Figures:**

**[0019]**       **Figure 1** is a schematic showing the relationships between business entities and a web site provided by the invention.

[0020] **Figure 2** is a schematic of a web site accessible system in accordance with the invention showing, one embodiment of a CAD configuration that provides users with an interface for changing and altering home design and altering modules.

5 [0021] **Figure 3** is a simplified example of one possible embodiment of a high-level page for a web site, featuring Design, Mortgage, Equipment, and Furnishings sub pages that represent vendors who may be utilized in home design.

10 [0022] **Figure 4** is an example of a tab layout of rooms, selection pulldowns and check boxes for room design.

[0023] **Figure 5** is a flow chart of the processes performed by a user in design in a home.

[0024] **Figure 6** is a flow chart of the interrelated processes used to design and build a home to a users specification.

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**Detailed Description of the Embodiments:**

20 [0025] The invention allows a diverse group of participants, builders, contractors, and consumers to work together for the benefit of all the participants. **Figure 1** illustrates some of the business relationships that may be supported by the present invention. These include designers (floorplans, exteriors, interiors), manufacturers, service providers (mortgage brokers, insurance companies), and developers.

25 [0026] With multiple sources for each relationship accessed via a Web site consumers benefit with greater value: expanded choices, better design, better quality and lower costs. The invention allows consumers to drive the homebuying experience instead of the developers. They have the option of



accessing the Web site via the Web itself or at the location (sales office) of a "franchised" developer.

5 [0027] Local developers benefit by having more competitive products to offer consumers. They may act as regional members. In this instance their responsibility includes the same responsibilities they now have in their existing business but the design and marketing of the home can be performed on the system provided by the invention. The construction of the home is then undertaken at a nearby affiliated plant and delivered to the job site. The shorter timeline for final product delivery reduces the developer's carry costs and contribute directly to his bottom line profit.

10 [0028] Well known architects can benefit from using the invention by receiving a design fee each time one of their designs is sold or used in designs of a job site or home.

15 [0029] The manufactured homebuilders benefit from the increased utilization of their existing plants. Several manufacturing companies may be affiliated to provide geographic coverage throughout the nation and ensure adequate capacity coverage.

20 [0030] In one embodiment, a computer assisted design (CAD) program is utilized as a back-end with a customized consumer interface on the front end. Homes are designed by the architects using the CAD program in a modular format such that each building module, section or design element can be built in the plant and transported to the site. Any CAD program or application can be used, but in most cases the best choice for CAD will be to choose the version the manufacturing plants are already utilizing for their current manufacturing practices. This is invariably AutoCad (from AutoDesk Inc.) although any comparable product could be used. Conversion routines may also assist in communication data from the designer to the manufacturer.

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**[0031]** The module design format allows the consumer to mix and match building components or design elements. Once the basis floor plan is chosen by the consumer, the home can be displayed in three-dimensions (3D) to allow selection of exterior and interior options. While the design and display process is being performed, the system can allow an automatic price to be computed and shown on the screen with every decision.

**[0032]** By including a financial questionnaire and a mortgage calculator, or incorporating existing on-line mortgage technologies (mortgage.com, for example), the consumer can input all their financial data to understand what financial programs are available and how much they can afford. This information can help drive their design and options decisions.

**[0033]** **Figure 1** shows an overview of a system according to the invention, and illustrates how the various entities may work together via a central location or service provider. The service provider may include a Web site **102**, through which the separate entities communicate. Other forms of central or distributed communication mechanisms can be used, including file transfer protocol, hypertext transfer protocol, extensible markup language (XML) and electronic mail data transfers. Home designers **104** may communicate their designs, including floorplan, exterior and interior design via a series of design agreements **112**. Similarly, manufacturers **106** may communicate information about their manufacturing capabilities and available capacity via a series of manufacturing agreements **114**. Developers **108**, which may include local and regional site developers can communicate information about their potential sites and franchises via developer agreements **116**. Additional service providers **110**, for example mortgage and insurance brokers, decorating companies, etc., can communicate via service agreements **118**. The result is an infrastructure of manufacturers, designers, developers and service providers that are connected

to each other via a series of direct links or relationships to a central service provider. Each of these manufacturers, designing or service providing entities contributes a design element to the system. The design elements are stored in a database at a central location where they may be chosen by a user in selecting preferred building components or design options. In one embodiment, indirect links or relationships **120, 122, 124**, allow the various entities to also communicate with each other independently of the central provider. The data transferred by indirect links need not be stored at a central location accessible by a user.

**[0034]** **Figure 2** illustrates one embodiment of how a user may use the system. As used herein, the term user is used to refer to any end-customer, property developer, or realtor that may use the system to design new homes or structures. The user, either at home or at a client site accesses a designer application **134**. The designer application includes a user interface **140**, CAD application components **142**, and a 3D component **144**. The user interface may be specially modified to allow a user to operate the CAD functions with little or no previous experience. It can also be modified to only allow a user to specify design elements or components that are currently offered by the manufacturers or designers. In one embodiment the user accesses designer application **134** via the Web **135** (or any other Internet protocol) and a Web server **136** acting as a host or service provider. Typically this will be via a Web home page **102** that is shared with or in communication with the entities shown in **Figure 1**.

**[0035]** The typical components of one embodiment of a Web home page **102** are shown in **Figure 3**. The home page includes links for design **150**, furnishings **152**, equipment **154**, and mortgage **156**. These allow a user to fully specify the new home or building. Additional options and services **158** such as garden, soil testing, and fencing can be added to the home page as necessary.

It will be evident to those skilled in the art that additional links to service providers can be added and that the invention should not be limited to the features shown here for example purposes.

**[0036]**        **Figure 4** illustrates an embodiment of a feature selection screen

5        **160** accessible to the user via the home page. Along the top of the screen appear a number of feature selection tabs **162**. These tabs are used to select areas of the building to be customized or designed. Selecting a tab, such as the kitchen tab **164** brings that area to the forefront of the screen. The user may then make selections to customize their room (the kitchen in this example) from a  
10        feature selection area **166** that includes pull-down selectors **168** and a check base selectors **170**. As each selection is made a floorplan of the room, or the entire building, is generated and displayed on screen together with any selected building design elements **172**.

**[0037]**        The process for designing such a room using the invention is shown in **Figure 5**. The process is started by accessing the Web page (step **180**). In step **182**, a user first selects a floorplan and/or an architect to base their design upon. The building modules or components are adjusted as necessary (step **184**). The user then designs each room in turn, (step **186**) adding design features, interiors, etc., until all of rooms have a design specification (step **188**).

20        At this point the user may return to add more building components, extra rooms perhaps (step **190**). If the user is finished they may end the program (step **192**). A copy of their design specification is saved in the system for later use.

#### The Consumer Experience

25        **[0038]**        In using one embodiment of the invention, the home buyer may first take a physical tour of a model home, where he/she will have an opportunity to see and feel the quality of the home. During this time, the consumer can become

acquainted with the system and gain an understanding of the options and the unique advantages available to them. After all of their questions have been answered and they are comfortable with using the system, a salesperson can sit down with them to help them design their own, personal and customized home.

- 5 The web site can be designed to include a list of model homes in close proximity to a user's location, together with viewing hours and directional maps. The user can then go to a sales office, or utilize the web site from his/her home PC to produce a design.

[0039] In one embodiment (after logon, for example), the web site displays  
10 a first series of screens that ask the consumer some basic lifestyle question to help the system recommend certain products (for example, that they are outdoors type, indoors person, car-owner, pets-owner, etc.).

[0040] The next series of screens (or selectable tab options, for example)  
15 leads the consumer through each room of the home, one at a time. Once the decision is made, the selection is saved and the next room is considered. When all rooms have been chosen, the entire floor plan is displayed for inspection and changes. 3D viewing is also available. Interior options such as stereo systems, lighting plans, kitchen appliances, finishes, etc., may be added, as can the exterior options like Cape Cod, Tudor, Modern, etc. style. The final design can  
20 then be saved or printed as a color brochure with detailed specifications and a complete pricing list.

#### Completing the Process

[0041] **Figure 6** illustrates one embodiment of the invention which utilizes  
25 the services of other entities to complete the process. The user first designs (step 200) and furnishes or otherwise determines the property interior (step 202). This information is used to calculate the price of the lot as determined by

information supplied by the developer (step **204**). The user may complete a mortgage application online to cover the cost of their design (step **206**). If the user is satisfied with their design the mortgage may be approved (step **210**). If for some reason the mortgage approval fails, the design may be reworked (step **211**) to fit within the user's budget. A successful mortgage approval allows the user to proceed to order the home (step **214**). Instructions to that effect are then delivered to the developer (step **216**) and the building is constructed.

**[0042]** Once the consumer is qualified online through a mortgage broker, an escrow is opened and the order is e-mailed to the manufacturing plant for home construction and to the local developer for site work. The home can generally be built in the plant within 30 days as compared to 120-180 days for site-built homes. At the same time, the local developer prepares the site with any necessary improvements like a foundation and driveway which can generally be completed before the home is delivered. Once the delivery is made, the local developer completes the installation within 30 days and escrow closes.

**[0043]** When escrow closes, the manufacturer is paid, the architect receives a fee, the central service provider (hosting the Web site) is paid its fee, and the developer recovers his local expenses and receives his profits.

**[0044]** The present invention may be conveniently implemented using a conventional general purpose or a specialized digital computer or microprocessor programmed according to the teachings of the present disclosure, as will be apparent to those skilled in the computer art.

**[0045]** Appropriate software coding can readily be prepared by skilled programmers based on the teachings of the present disclosure, as will be apparent to those skilled in the software art. The invention may also be implemented by the preparation of application specific integrated circuits or by

interconnecting an appropriate network of conventional component circuits, as will be readily apparent to those skilled in the art.

5 [0046] The present invention includes a computer program product which is a storage medium (media) having instructions stored thereon/in which can be used to control, or cause, a computer to perform any of the processes of the present invention. The storage medium can include, but is not limited to, any type of disk including floppy disks, optical discs, DVD, CD-ROMs, microdrive, and magneto-optical disks, ROMs, RAMs, EPROMs, EEPROMs, DRAMs, VRAMs, 10 flash memory devices, magnetic or optical cards, nanosystems (including molecular memory ICs), RAID devices, remote data storage / archive / warehousing, or any type of media or device suitable for storing instructions and/or data.

15 [0047] Stored on any one of the computer readable medium (media), the present invention includes software for controlling both the hardware of the general purpose/specialized computer or microprocessor, and for enabling the computer or microprocessor to interact with a human user or other mechanism utilizing the results of the present invention. Such software may include, but is not limited to, device drivers, operating systems, and user applications. Ultimately, such computer readable media further includes software for performing the 20 present invention, as described above.

[0048] Included in the programming (software) of the general/specialized computer or microprocessor are software modules for implementing the teachings of the present invention, including, but not limited to, user interface modules for connecting a user to a CAD design application (Auto-CAD, for 25 example), furnishings, home developer, and other home purchasing software and communications links, database programming and related software for storing user (customer) and designer designs, floor plans and product selections, html

programming for presentation of the website and associate links, applications, and other functions, and the display, storage, or communication of results according to the processes of the present invention.

5 [0049] Web Site as used herein is intended to be broadly construed to include any configuration of servers, computers, routers, store/forward, and peripheral equipment devices that are either directly connected, connected via a network, or otherwise coupled or utilized in conjunction to provide the web page and related links and resources to a user (end user, customer, supplier, content provider, service provider, etc.) or other individual or system that utilizes  
10 the web site. For example, the web site or server contains a database of products that may be viewed, selected, added to, or modified by a user. The database program may run on a same computer device physical server as the server (a) which sends virtual and other page-related information (applets, graphics, etc.) to a user's computer, or may be located on a separate computing  
15 device coupled to the server (a).

[0050] Obviously, numerous modifications and variations of the present invention are possible in light of the above teachings. It is therefore to be understood that within the scope of the appended claims, the invention may be practiced otherwise than as specifically described herein.

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#### Industrial Applicability

[0051] The system described by the invention answers a need to bridge the gap between low-end mobile home type developments and higher end site-built developments. The technology will be of interest to local developers and  
25 manufactured housing companies, eventually including the larger regional homebuilders.



**[0052]** The invention is well positioned to withstand competition with its ability to help develop a structure that enjoys lower overhead, due to the outsourced business features. As such, the invention should be welcomed in an industry that has not had a significant technology breakthrough in over 100 years.

5     **[0053]**         Most national and local builders operate on a 5% net margin. The inventors believe that the net margin opportunity using the invention is closer to 30%. The pricing strategy should be to price the end product close to the site-built alternatives, while selling the consumer the benefits of home customization and quality design. There is plenty of margin to include the various players; including designers, local developers, and the service provider hosting the service.